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ABSTRACT

Two populations of undergraduate students (preservice elementary education majors and noneducation majors) were compared with respect to their attitudes toward learning in the content areas of history, literature, mathematics, reading, and science. The study attempted to answer the following questions: (1) To what extent are preservice elementary teachers interested in learning subject matter content? and (2) To what extent do they believe understanding these subject matter areas is an important educational goal? The Survey of Educational Attitudes was administered to all participants. Data suggest that education majors' attitudes reflect generalized ambivalence toward important subject areas taught in elementary school, with significantly more positive attitudes displayed toward reading and literature than toward science, mathematics, and history. In spite of highly visible recommendations for more extensive academic coursework, results indicate the impracticality of addressing teacher competence through added coursework before appropriate attitude adjustment processes have been planned and implemented. (LL)

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Educational Attitudes of Preservice Teachers, or "Redesigning the Edsel" of Teacher Education

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Educational Attitudes of Preservice Teachers,

or "Redesigning the Edsel" of Teacher Education

Research during the past two decades has created the distinct impression that elementary teachers do not possess a sufficient understanding of subject matter content to be genuinely effective (Brown, Cooney, & Jones, 1990, p. 643). The most widespread solution to this situation -- more thorough grounding in academic content for prospective teachers -- springs from the chorus of recommendations by such notables as the National Commission on Excellence in Education, the Carnegie Forum on Education and the Economy, and the Holmes Group. The presumed connection between coursework and learning is not straightforward, however, since college students report that the more they study mathematics the less they like learning about it (Galbraith, 1984).

Still, a relevant empirical question for educational planners is: are prospective teachers actually interested in learning the subject matter they will be expected to teach? Ball and McDiarmid (1990) have argued that "because teachers' work is centrally involved with knowledge and the life of the mind, their own intellectual qualities are critical. Teachers must care about knowing and about inquiry" (p. 443). Evidence suggests, however, that such "caring and knowing" may not always occur. For example, elementary teachers often treat science as a low priority relative to other subjects and sometimes try to avoid teaching it at all (Schoenberger & Russell, 1986; Stake & Easley, 1978). Even when science is taught, elementary instruction is often ineffective in promoting student achievement (Denny, 1978).

Ineffective elementary instruction has also been reported in the areas of mathematics and social studies. Willoughby (1990), for example, attributes ineffectiveness to teachers who spend far too much time "dumbing down" and repeating previously learned mathematics material at all elementary grade levels. Similarly, social studies textbooks are often filled with "superficial, redundant, and superfluous information" (Larkins, Hawkins, & Gilmore, 1987) that is not educationally sound.

Given the plethora of training, curriculum guides, and instructional materials available for elementary teachers in the areas of mathematics and science, why is it that elementary students achieve uninspiring levels of performance? One of the most prominent explanations found in the available literature suggests the influence of teachers' underlying negative attitudes toward the content and processes of these two important content areas (Buhlman & Young, 1982; Hembree, 1990; Kelly & Tomhave, 1985; Koballa & Crawley, 1985; Morrisey, 1981; Munby, 1983). In contrast, educational researchers have given virtually no attention to systematic assessments of teachers' attitudes toward other core elementary content areas such as social studies and language arts. In fact, attitude research in these areas during the past decade is notably absent from the 1990 Handbook of Research on Teacher Education.

Although poor mathematics and science attitudes of elementary teachers has been well documented, no empirical attempts have been made to locate

those attitudes within the larger context of the elementary school curriculum. What is not known, for example, is whether teachers' negative attitudes toward science and mathematics exist in isolation from other subjects or whether these attitudes are subordinated to more general attitudes toward learning and the crucial "attitude of mind" described by Ball and McDiarmid (1990). The central issue here is empirical. Are teachers committed to "an attitude of mind" reflecting the important values of knowledge and inquiry? Are they interested in the content of teaching, and do they think such content is important?

Attitudes of preservice teachers are particularly important because, while they are relatively stable, they are also learned, implying that an effective collegiate experience could result in attitude change (Koballa, 1988). At the same time, designing appropriate collegiate experiences necessarily depends on knowing what preservice teachers' attitudes are and how they compare across subject matter areas. Moreover, it is not known if education majors and other majors share similar or different attitudes toward these domains.

The research reported here was designed to compare attitudes across five subject areas -- history, literature, mathematics, reading, science -- and between two populations of undergraduate students -- elementary education and noneducation majors. More specifically, the study attempted to answer the following questions: To what extent are preservice elementary teachers interested in learning subject matter content? To what extent do they believe understanding these subject matter areas are important educational goals? Finally, to what extent do preservice elementary teachers compare with noneducation students in each of the above respects?

Negative perceptions of elementary teachers would lead us to expect sharp discrepancies between elementary education majors and noneducation majors. Specifically, the four research hypotheses tested were:

H1: Elementary education majors hold less favorable attitudes toward reading, mathematics, science, literature, and history than noneducation majors.

H2. Elementary education majors exhibit less interest in reading, mathematics, science, literature, and history than noneducation majors.

H3: Elementary education majors view reading, mathematics, science, literature, and history as less important as educational goals than noneducation majors.

H4. Elementary education majors exhibit different attitudes toward subject matter areas of reading, mathematics, science, literature, and history.

Method

Sample

The sample consisted of 161 elementary education majors, 155 other

education majors (e.g., special education, art education, middle grades, secondary), and 111 noneducation majors. These students were systematically (volunteer) sampled from five sections of a sophomore level "Introduction to Education" course during the 1990-91 academic year at the University of North Carolina - Charlotte.

Education and noneducation majors enroll in this course for different reasons. It is required for education majors, but it is also one of several courses which fulfill a general education requirement for noneducation majors. Noneducation majors comprised 26 percent of the volunteer sample and 29 percent of enrollment. Additionally, freshmen and sophomores constituted 60 percent, while juniors and seniors comprised the remaining 40 percent of the sample. Of particular interest in this study, females constituted 97 percent of the elementary education majors but only 61 percent of the noneducation majors.

Concerning the results reported here, all subjects were used to determine instrument reliability. Many groups in the "other education" sample contained insufficient numbers for meaningful analysis. Consequently, relevant tests of the research hypotheses reported below utilized only the elementary education and noneducation majors.

Instrumentation

A survey instrument -- The Survey of Educational Attitudes (SEA) -- designed to elicit attitudes toward five subject matter areas was pilot tested on a class of 54 students and subsequently revised. The revised survey contained 72 Likert scaled statements about education in general and about history, literature, mathematics, reading, and science. Twelve statements measured attitudes toward each subject area, and these were further divided into three subscales: Interest/motivation (4 items), Importance (4 items), and Myths (4 items). Interest/motivation items assessed students' personal interest/motivation to learn about a particular subject (e.g., "The more I study science, the more I like it"). Importance subscale items measured beliefs about the importance of understanding a particular subject as a goal of education (e.g., "Understanding the great works of literature is an important educational goal"). Finally, beliefs in common myths about learning (which could influence later instructional practices) were measured by the Myth subscale (e.g., "Some people just think differently than other people, and that's why its easier for them to understand mathematics"). Each scale contained items worded both positively (for which an agreeing response would be favorable) and negatively (for which an agreeing response would be unfavorable).

The subject area scales contained parallel items, with differences only in wording of the content area -- for example, "I look forward to taking [history, literature, math, reading, science] courses." Consequently, the survey reported here contained five subject area scales, each with three parallel subscales, each with four parallel items (3 x 5 x 4 items) plus an additional twelve items which elicited attitudes toward general educational issues (e.g., "Discipline is the single biggest problem in schools today"). Items were randomly sequenced using a random number table. The instrument was administered during class time and took approximately 20 minutes to complete.

Scoring

Responses for all items were converted to a new scale according to the strength of attitude expressed in terms of the context of each statement. The idea was to weight evidence of positive attitudes high and evidence of negative attitudes low. Responses to negative statements (e.g., "Science courses have little practical value") and negative myth statements (e.g., "The best way to understand science is by memorizing its concepts") were recoded to the new scale by inverting the weights of the original item scale. In other words, responses of "strongly agree" were recoded to "1" because they represent strongly negative attitudes, while original responses of "strongly disagree" were recoded to 5 to indicate strongly positive attitudes. Responses to the remaining items, simple positive statements (e.g., "Science courses are generally interesting"), were converted to the new scale using the same response values of the original scale (e.g., 1 = strongly disagree = strongly negative attitude).

Scale means for each subject area were determined by computing the overall mean rank of the 12 relevant items. In addition, separate subscale mean ranks were computed from items comprising each of the Interest/motivation, Importance, and Myth subscales.

Results

Instrument Psychometrics

To assess reliability, Chronbach's alpha, a measure of internal consistency, was obtained for the entire survey instrument, including the general purpose education items (alpha = .87). Separate reliability estimates for each of the five subscales ranged from .74 for Reading to .78 for History. The Spearman-Brown formula (see Salvia & Ysseldyke, 1991, pp. 129-130) was applied to these coefficients to correct for instrument length and yielded internal consistency reliabilities of r = .93 for the entire instrument and ranged from .85 for Reading to .88 for History. These reliability coefficients compare favorably with the .80 cutoff criterion for internal consistency reliability recommended by Crano and Brewer (1973).

Table 1 exhibits mean ranks of elementary education majors and noneducation majors for each of the five subject areas. One striking pattern in the table is the remarkable consistency of responses. For example, each

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Insert Table 1 about here

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subject area is rated positively (a value of 3 = undecided) by both samples. It can also be noted that attitudes toward the five subject areas reflected exactly the same order for both groups of students -- literature is rated highest, followed in order by reading, history, science, and mathematics.

A single set of Mann-Whitney U tests was used to determine whether or not significant differences in attitude existed between elementary education majors and noneducation majors for each of the five subject areas. For large samples, U is distributed approximately as z (Siegel, 1956), which is also displayed in Table 1.

For the subject area scales, elementary education majors exhibited more positive overall attitudes than noneducation majors in only one area, mathematics, but this difference was not statistically significant. Conversely, noneducation majors held more positive attitudes toward reading, science, literature, and history than elementary education majors, but only the reading ($z = -2.435$, $df = 271$, $p = .015$) and history ($z = -3.198$, $df = 271$, $p = .002$) scales were statistically significant.

Table 2 contains the results of Mann-Whitney U comparisons between the samples for the Interest and Importance subscales of the five content areas. None of these comparisons approached statistical significance.

A Kendall coefficient of concordance (Siegel, 1956) was computed to determine if any differences occurred between subject matter scales within

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Insert Table 2 about here

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either sample. The results showed the presence of one or more significant differences (chi-square = 105.65, df=4, $p < .0001$). Consequently, a Wilcoxon matched-pairs signed-ranks test (Siegel, 1956) was used to examine within group attitude differences between selected content area pairs. According to Siegel (1956), this test is sensitive to the magnitude as well as the direction of differences between matched pairs of observations. Such information is useful to our analysis, because we wanted to know whether or not subject matter pairs reflected differences and whether such differences exhibited the same direction within each sample. For large samples, results of the Wilcoxon test are distributed approximately as z. Table 3 contains z scores and their associated probabilities.

Wilcoxon tests revealed the presence of within group differences in both samples for the literature versus reading scales comparison. Beyond that, however, different patterns emerged for elementary education and

Insert Table 3 about here

noneducation majors. For example, noneducation majors held significantly more positive attitudes toward reading than toward history, science, or mathematics. Noneducation majors, in contrast, held equivalent attitudes toward reading and history but displayed more positive attitudes toward history than toward science and were also more positive toward science than mathematics.

Discussion

The results only partially supported the first research hypothesis. Elementary education majors exhibited lower attitudes than noneducation majors for four of the five subject matter areas (literature, reading, history, and science), but only the Reading and History scales were statistically significant. Contrary to our expectations, preservice elementary teachers displayed slightly more positive (but not statistically significant) attitudes toward mathematics than did the noneducation majors. Most surprising, however, was the finding that noneducation majors exhibited significantly more positive attitudes on the Reading scale than did elementary education majors. This result was amplified by the Reading Importance subscale, where noneducation majors viewed reading as a more important goal of education than did education majors. One possible explanation for this pattern of results could be that the two samples interpreted Reading items differently. For example, education majors who expect to teach may have interpreted reading items in terms of "learning how to read," whereas noneducation majors may have personalized reading items in terms of "reading for information."

Preservice teachers should be expected to highly value the subjects they will teach, especially core subjects so important to the development of a critical, analytic "attitude of mind" toward knowledge and inquiry. Our data indicated that they do not. The general pattern of attitudes exhibited by each of our two samples was a mean rank between "Undecided" and "Agree" on each of the five subject area scales, suggesting ardent indifference or slightly positive ambivalence toward each content area measured. On an absolute scale, we expected elementary majors to exhibit more positive attitudes toward important elementary school subject matter and are disappointed that their ambivalent attitudes were not significantly more positive than noneducation majors' who will have little responsibility for teaching.

The second research hypothesis -- interest -- was not accepted. With the exception of mathematics, prospective elementary teachers were less interested in subject matter content than noneducation majors, although only the History Interest subscale reached statistical significance. If generalizable to other college populations, such results pose a serious dilemma for recruiting preservice elementary teachers since neither they nor their noneducation cohorts appear particularly interested in learning.

The third hypothesis -- importance -- was partly accepted. With the exception of mathematics, elementary education majors consistently viewed subject matter areas as less important goals of education than their noneducation peers, although only Literature and History were statistically significant. These results call into question the image of preservice elementary teachers as having poor attitudes toward science and mathematics. Since that image was not confirmed in our sample, at least in comparison to noneducation majors, we believe that if our results are generalizable to other populations of preservice tesachers, a potential opportunity exists for teacher education programs. Specifically, since science and mathematics were viewed as important subject areas for education, teacher educators may benefit from curriculum revisions which enhance teacher learning by concentrating on making coursework in these areas more relevance and interesting.

The fourth research hypothesis concerned differences in attitudes of elementary majors toward the five subject matter content areas. The within group Wilcoxon tests indicated that attitudes toward literature were significantly more positive than toward reading, which in turn were significantly more positive than attitudes toward history, science, or mathematics. We were surprised that attitudes toward reading were not higher, since the elementary curriculum places so much emphasis on reading. Also, attitudes toward history were surprisingly similar to science and mathematics for elementary education majors. Conceptually, science and mathematics comprise the foundation of the natural sciences, while history is categorized as a social science -- a clear dichotomy. It may be that the common theme running throughout these subject areas is memorizing (names, dates, events, formulas, facts) and that preservice elementary teachers simply do not like to memorize. Could it be that these students see history as memorizing names, dates, and events, just as they tend to view science and mathematics as memorizing theorems, formulas, and facts? Further research could test this "memorizing" hypothesis by isolating the cognitive requirements or affective components associated with history, science, and mathematics on the one hand and reading and literature on the other. Finally, a compelling threat to a balanced elementary curriculum exists when future teachers exhibit such clear preferences for language arts subjects (literature and reading) over other subjects which may be mistakenly believed to require extensive use of memory. If empirical research shows that these results can be generalized to practicing elementary teachers, then a clearer understanding of how underlying attitudes influence the shape of teaching practices will have emerged. One clear implication seems to be that teacher behaviors are unlikely to change without concerted effort directed at changing their attitudes.

Conclusion

In an ideal world we would naturally prefer future teachers to be strongly committed to the subject matter they must teach, or at the very least to be more strongly committed than those not pursuing teaching as a career. The intrusion of reality, in terms of the data reported here, however, should prompt us to question why it is that elementary majors choose teaching as a career. Whatever their motives, our sample's typical attitudes are masked by conspicuous, generalized ambivalence toward impor-

tant subject areas taught in elementary school. To the extent that our findings are generalizable to the larger population of preservice as well as inservice elementary teachers, the cognitive context of ambivalence reported here raises many important issues about recruitment, education, role models, curriculum, and even career inservice training.

Finally, two additional concerns are motivated by the findings reported here. First, elementary teachers exhibited significantly more positive attitudes toward reading and literature than toward science, mathematics, and history. It is reasonable to expect that these attitudes have a strong influence on learning, tending, as is natural, to promote learning more about subjects which are liked and less about those which are not. In terms of our sample, such a tendency would ultimately result in these students knowing more about the teaching of language arts than about the teaching of science, mathematics, and history. Our second concern follows logically from the first. Lesson planning in the classroom requires decisions about time management and subject matter priorities. In this context, class time needed for the litany of educational supplements (e.g., field trips, movies, school programs, special events, testing) will, we suspect, quite naturally be drawn from those subjects teachers know less about or which are deemed to be less important.

In spite of highly visible recommendations for more extensive academic coursework, the results presented here suggest the impracticality of addressing teacher competence through added coursework before appropriate "attitude adjustment" processes have been planned and implemented. Preservice teachers should know that their teaching will necessarily depend on their own learning. Their own learning, in turn, regulated by their underlying attitudes.

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Mean Ranks and Mann-Whitney U z-scores of Comparisons between Elementary Education and Noneducation Students for Five Subject Areas

	Mean Ranks			
	Elementary Education	Noneducation	z	2-tailed p
Subject Area	(n=161)	(n=111)		
Literature	3.56	3.63	-1.542	.123
Reading	3.44	3.58	-2.435	.015
History	3.29	3.51	-3.198	.002
Science	3.23	3.27	-.703	.482
Mathematics	3.20	3.15	.408	.684

NOTE: A negative z indicates mean rank of noneducation majors is higher than mean rank of elementary education majors.

Table 1

Mean Ranks and Mann-Whitney U z-scores of Comparisons between Elementary Education and Noneducation Students for Two Subscales in Five Subject Areas

	Mean Ranks			
	Elementary Education	Noneducation	z	2-tailed p
SUBSCALES				
Reading				
Interest/motivation	3.12	3.32	-1.916	.056
Importance	3.90	4.01	-1.653	.098
Mathematics				
Interest/motivation	2.73	2.56	1.113	.266
Importance	3.82	3.78	.343	.731
Science				
Interest/motivation	2.97	3.09	- .974	.330
Importance	3.54	3.57	- .616	.538
Literature				
Interest/motivation	3.52	3.60	-1.22	.222
Importance	3.55	3.68	-2.05	.040
History				
Interest/motivation	3.07	3.59	-4.097	.001
Importance	3.51	3.72	-2.8772	.004

NOTE: A negative z indicates that education majors have lower mean ranks than noneducation majors.

Table 2

Wilcoxon Matched-pairs Signed-ranks Test for Within Group Comparisons

	Elementary Majors		Noneducation Majors	
	z	2-tailed p	z	2-tailed p
Literature vs Reading	3.79	.001	5.42	.001
Reading vs History	3.91	.001	.99	.322
History vs Science	-1.57	.117	-3.67	.001
Science vs Mathematics	.75	.454	-2.51	.012

NOTE: A negative z signifies less positive attitudes toward that subject than toward science.

Table 3